

REMARKS

Applicant thanks the Examiner for the careful review of this application. The specification was amended to correct clerical errors. Claims 1, 3, 5, 7-8 and 24 were amended to clarify aspects of the present invention. No new matter was added. Claim 2 was canceled without prejudice. Therefore, claims 1 and 3-24 remain pending in this application.

DRAWINGS

Figs. 1A, 1B, 1C, 1D and 1E were objected to because they were not labeled as --Prior Art--. Applicant notes that there is no Fig. 1E in this application and that the Brief Description of the Drawings section had a clerical error alluding to a Fig. 1E. There were no other references to a Fig. 1E elsewhere in the specification. The Brief Description has been amended to correct this clerical error. Figs. 1A, 1B, 1C and 1D have been labeled as --Prior Art-- and a replacement sheet of drawings can be found at Appendix A of this paper.

REJECTIONS UNDER 35 U.S.C. § 102(b)

Claims 1-3 and 5 were rejected under 35 U.S.C. § 102(b) as being anticipated by Huang (U.S. Patent No. 6,118,488). Claim 24 was rejected under 35 U.S.C. § 102(b) as being anticipated by Shin (U.S. Patent No. 6,630,961). Applicant respectfully traverses for the following reasons.

Huang apparently discloses a method for generating a progressive scanning video image that includes selecting a first 1-D pixel array in a first image field and a second 1-D pixel array in a second image field. A value is computed between said first and second array by comparing the sum of the absolute value of the difference between said first and second array with a predetermined threshold value. An interpolated pixel value is then determined according to said value and interpolating said interpolated pixel value into an interlaced video image to be converted to the progressive scanning video image.

Shin apparently discloses a deinterlacing device that includes a field memory for storing m continuous field data containing an nth field data and positioned before and after the nth field

data on the basis of the nth field data of a plurality of field data for output image. Also included is a motion determination part for detecting picture element values and brightness profile pattern difference values in specific lines existing among the field data stored in the field memory to calculate a motion value of a moving picture. A spatial interpolator is used for calculating a variation direction of picture element values on an area to be interpolated in the nth field data to output a direction value. A time interpolator is used for averaging the picture element values on the area to be interpolated in a previous field data of the nth field data and the picture element values on the area to be interpolated in a next field data of the nth field data to output the picture element average value. Lastly, a soft switch is used for mixing the direction value outputted from the spatial interpolator and the picture element average value outputted from the time interpolator, based upon the motion value determined in the motion determination part to output the mixed result.

Embodiments of the Applicant's inventions are directed to methods for deinterlacing a video source that includes filtering a 2-dimensional array of image elements surrounding a pixel location resulting in a filtered set of data wherein the 2-dimensional array of image elements are all from a temporally current field. An edge of an image and an orientation of the edge are then detected based on the filtered set of data. Finally, a new pixel is calculated based on the orientation of the edge in the image. Support for the 2-dimensional array of image elements is from a temporally current field can be found at numerous locations in the specification. For example, page 11, lines 11-19 that is reproduced here for the Examiner's convenience:

"The edge detection method of the preferred embodiment of the present invention is performed upon a two-dimensional array of pixels 70, as shown as Figure 4. The array is centered around the pixel to be calculated 72, and is composed of eleven rows 74 and twenty-five columns 76 of pixels. The even numbered rows 78 are from the temporally current field and are the basis of the edge detection calculation. The odd numbered rows 80 are from the field immediately previous to the current field. These previous field rows are interleaved with the current field rows due to the interlaced nature of the video source. The previous field rows are not used in the actual edge detection calculations since they are not temporally consistent with the temporal baseline of the current field."

In marked contrast, Huang's disclosure requires the use of pixels from temporally different fields. For example, Huang detects motion by examining fields immediately before and after the current field such as that described in Huang column 3, lines 19-25:

"The motion detection mechanism uses the two consecutive fields i-1 and i+1 that immediately precede and follow field i, where i-1 and i+1 denotes fields of a second polarity (33). That is to say, when i corresponds to the bottom field, fields i-1 and i+1 are consecutive top fields; and when i corresponds to the top field, fields i-1 and i+1 are consecutive bottom fields."

Disadvantageously, the requirement to use multiple fields unnecessarily complicates Huang's disclosure. Since multiple fields need to be tracked, albeit only subsets of each field, additional memory components are required to keep track of those extra fields. As a result, one skilled in the art would not look to Huang to solve the problems of the prior art. The claimed embodiments do not suffer from this deficiency.

Embodiments of the present invention are also directed to an image feature edge detector that includes a horizontal filter means receptive to a vertically aligned luma data stream and providing a filtered luma data stream wherein the vertically aligned luma data stream are from a temporally current field. An edge direction calculation means is receptive to the filtered luma data stream and providing an indication of an edge direction and a post-detection filter array means that is receptive to the indication of the edge direction and providing a final indication of an edge direction. Regarding the vertically aligned luma data stream that is composed of luma from the same field, support for this embodiment can be found in figure 6 and the specification on page 14, lines 8 through 23 and is repeated here for the Examiner's convenience (emphasis added):

"A block diagram of the preferred embodiment of the edge direction method is shown in Figure 6. Luma pixel data from four rows of the current field 100 is presented to a horizontal lowpass filter 102, which filters the raw pixel data to remove noise and small irregularities in the image prior to edge detection. It will be appreciated by one skilled in the art that the horizontal lowpass filter 102 could be a vertical lowpass filter that filters vertically. Also, the filter, 102 could also be a horizontal/vertical lowpass filter that filters in both the horizontal and vertical

directions. The lowpass-filtered pixel data is stored in a two-dimensional pixel storage array 104, which stores thirteen luma data samples for each of the four input rows. This 2D array of pixel data is made available to the previously described bank of directional halfband highpass filters 106, which calculate the amplitude of the high frequency components in the video image along ten different directional vectors (as shown in Figure 5), with two filters (above and below pixel to be calculated) for each of the ten directions. The magnitudes of the outputs of the same direction filter pairs are averaged by module 108. The averaged directional highpass filter values are provided as an input to the edge direction calculation module 110, which selects a single edge direction based on the directional highpass filter outputs and a number of other parameters described below."

Similar to Huang, Shin also requires the use of pixels from non-contemporaneous fields such as the ones described in Shin at column 14, lines 13-25:

"First, if the line to be interpolated is a kth line, a predetermined sliding window is set on k+1th and k-1th lines, respectively, within, the predetermined observation window. And, the sliding window on the k=1th line shifts from left to right and the sliding window on the k+1th slice shifts from right to left. The difference values of the picture elements positioned in the diagonal direction to each sliding window are detected and added, thereby calculating the variation amount of the picture element values. At this time, the present invention sets the shifting intervals of the sliding window to a half unit of the interval of adjacent picture element, but may set them to more precise intervals, for example, 1/4, 1/8 and so on."

Therefore, Shin also requires the consideration of multiple fields – a limitation not found in the claimed embodiments

Claim 2 was canceled without prejudice therefore the rejection of claim 2 is now moot. Claims 3 and 5 depend directly or indirectly from independent claim 1 and are allowable at least for the reasons set forth for independent claim 1. Withdrawal of the rejections of claims 1, 3, 5 and 24 is respectfully requested.

REJECTIONS UNDER 35 U.S.C. § 103(a)

Claims 4 and 6 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Huang (U.S. Patent No. 6,118,488). Claims 4 and 6 depend indirectly from independent claim 1 and

Applicant respectfully submits that these claims are allowable at least for the reasons put forth in the previous section regarding claim 1. Withdrawal of the rejections of claims 4 and 6 is respectfully requested.

ALLOWABLE SUBJECT MATTER

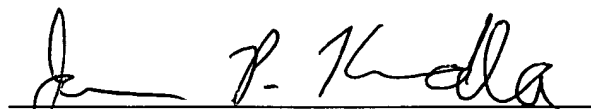
Applicant thanks the Examiner for noting the presence of allowable subject matter in claims 9-23. Additionally, the Examiner indicated that claims 7-8 would be allowable if rewritten in independent form including all of the limitations of the base and intervening claims. Claims 7-8 have been rewritten into independent form and Applicant respectfully submits that they are now allowable.

CONCLUSION

Applicant believes that all pending claims are allowable and a Notice of Allowance is respectfully requested. The amendment was made to expedite the prosecution of this application. Applicant respectfully traverses the rejections of the amended claims and reserves the right to re-introduce them and claims of an equivalent scope in a continuation application.

If the Examiner believes that a conference would be of value in expediting the prosecution of this application, he is cordially invited to telephone the undersigned counsel at the number set out below.

Respectfully submitted,
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APPENDIX A
REPLACEMENT SHEET OF DRAWINGS